

4 | 2

\$214

I-069

1

Inquiry To The CALFED Bay/Delta Category III Program**Project Title:** On-Farm Habitat For Migrant Birds: Establishing and Evaluating Hedgerow Vegetation To Support Sensitive Species**Applicant Name:** U.C. Sustainable Agriculture Research and Education Program, One Shields Avenue, University of California, Davis, CA 95616-8716**Contact:** Robert L. Bugg, Ph.D., Assistant To The Director, 916-754-8549
rlbugg@ucdavis.edu**Project Description and Primary Biological/Ecological Objectives:**

Conventional farming in Yolo County and most other parts of the Central Valley has led to vast stretches of field crops and sprayed orchards that do not support migrant birds (Table 1). Increasing numbers of farmers are now choosing to revegetate fencerows, waste areas, and riparian zones, yet little is currently known about the best complexes of plants to support migrant birds that use the Valley during fall, winter, and spring (Table 2). We propose to develop detailed, formal, long-term comparisons to test the use by migrants of various complexes of native and introduced vegetation that can be used on farms.

The Russell Ranch is a 1400-acre parcel located 4 miles west of the main campus and acquired in 1991 by the University of California, Davis. This parcel is intended to perform at least two important functions: (1) Provide a site for agricultural experiments; and (2) Accommodate environmental mitigation projects to compensate for loss of wildlands caused by U.C. development elsewhere. We here propose a project by which the University can achieve both goals at once: we propose to develop a research project that will test the wildlife habitat value of various complexes of vegetation either native to or commonly found in the Sacramento Valley. In particular, we wish to assess use by migrant and resident birds of the various complexes of vegetation. The study is intended to last 20 years, after which time those complexes not devoted entirely to native vegetation may be converted to that condition.

Approach/Task/Schedules: The experimental site will be at the University of California, Davis, Russell Ranch, in an area currently occupied by a 610-m long hybrid poplar windbreak, adjoining the Long Term Research on Agricultural Systems plots, and parallel to Putah Creek. The design of the plantings will be randomized complete block, with 10 replications or blocks. Each experimental block will be laid out linearly. The factor of interest will be "vegetational complex," which will have four (4) levels (see the indicated tables for plant species lists):

- (1) Resident (weedy) vegetation (Table 3);
- (2) Non-native cultivated plants commonly used in the Sacramento Valley (Table 4);
- (3) Locally native plant species (Table 5);
- (4) Augmented native plants, including local species and plants native to other parts of California thought to have special wildlife value (Table 6).

Plots will be 5 m X 50 m. In levels 2-4, trees and shrubs will be set amid matrices of perennial grasses. Thus, the total length of the trial habitat zone will be 1000 m, and the total area will be 5,000 m².

Establishment of plant complexes will follow the removal of the poplar windbreak, and will be per the schedule contained in Table 7, slightly adapted for factor level 2.

Justification for Project and Funding by CALFED: On-farm habitat plantings can sustain wide diversities of bird life, including sensitive migrant species, as shown from the species list obtained from Hedgerow Farms, Winters, California (Table 2). By contrast, a limited range of species make use of conventional farmlands (Table 1). Many practitioners of restoration ecology believe that hedgerows of native vegetation or specially selected plant materials provide better subsistence to resident and migratory birds than do commonly used introduced plant species. However, this idea has yet to be tested in a rigorous, replicated field-scale experiment. We propose to conduct this test.

Budget Costs and Third Party Impacts: The estimated cost for this project will be \$5,500 for propagation and establishment of the habitat plants (per Table 7). Thereafter, maintenance will require \$1,500 per year. Mr. Craig Thomsen will be compensated for 1/4

time work on this project at \$12,300 (including benefits). In addition, a full-time graduate student Research Associate will be employed through U.C. SAREP at ca \$37,000 per year including benefits and tuition. Thus, the first year total amount requested will be \$54,800, and the amount for each of the subsequent two years will be \$50,800. When 37% If University overhead is factored in, the total amounts will be increased to \$75,076 for the first year and \$69,596 for each of the two following years.

Applicant Qualifications: Dr. Bugg and cooperators (see List of Cooperators) have extensive experience in field research, the development of scholarly publications, and the extension of practical programs for habitat enhancement. Dr. Bugg is co-founder of the Biologically Integrated Orchard Systems (BIOS) projects, and continues to serve on the Almond BIOS Management Team for San Joaquin County (see Bugg's brief resume, attachments). Dr. D. Michael Fry has conducted numerous studies on toxicological impacts on wild birds, and has also been instrumental in evaluating on-farm habitat for raptors and extending his findings to farmers. Mr. Craig Thomsen is an authority on California native plants, and recently set up the Valley Grasslands section of the U.C. Davis Arboretum. Mr. Paul Robins has been intensively involved in on-farm habitat establishment in Yolo County. Drs. Dennison, England, and Yates are involved in the administration of the Russell Ranch, and will be instrumental in implementing the project.

Monitoring and Data Evaluation: Sampling techniques to evaluate use of habitat by birds will entail standard field techniques, including visual observations conducted at various times of the year. Statistical analysis will be by analysis of variance and other appropriate models. Results will be disseminated through scholarly and popular publications, field days, workshops, and presentations by the investigators to audiences of farmers, land managers, scientists, and policy makers.

Attachments

Table 1. Birds observed at a conventional farm in Yolo County (Paul Robins, unpublished data).

MONITORING DATA FROM CONVENTIONAL FARM October 1995 - June 97	
VERNACULAR NAME	
Great Blue Heron	
Snowy Egret	
Mallard	
Northern Harrier	
Killdeer	
Rock Dove	
Swallow sp.	
American Crow	
European Starling	
Red-winged Blackbird	
Brewer's Blackbird	
Brown-headed Cowbird	

Table 2. Birds observed at Hedgerow Farms (Yolo County Roads 27 and 88, between Winters and Esparto, Yolo County, California) (R. Jones and J.H. Anderson, personal communications).

Order: Common Names	Order: Common Names
Ciconiiformes:	Passeriformes (continued)
American Bittern	Northern Rough-Winged Swallow
Great Egret	Scrub Jay
Snowy Egret	Yellow-Billed Magpie
Green Heron	Common Raven
Great Blue Heron	American Crow
Anseriformes:	Plain Titmouse
Mallard	Bush-Tit
Cinnamon Teal	Redbreasted Nuthatch
Falconiformes	Bewick's Wren, House Wren
Turkey Vulture	Ruby Crowned Kinglet
Black-Shouldered Kite	Hermit Thrush
Northern Harrier	Swainson's Thrush
Golden Eagle	American Robin
Red-Tailed Hawk	Western Bluebird
Swainson's Hawk	Mountain Bluebird
Rough-Legged Hawk	Northern Mockingbird
American Kestrel	American Pipit
Merlin	Cedar Waxwing
Prairie Falcon	Loggerhead Shrike
Galliformes	European Starling
Ring-Necked Pheasant	Warbling Vireo
California Quail	Yellow-Rumped Warbler
Charadriiformes	Yellow Warbler
Killdeer	Wilson's Warbler
Longbilled Curlew	Orange-Crowned Warbler
Columbiformes:	Black-Throated Grey Warbler
Mourning Dove	Townsend's Warbler
Rock Dove	Hermit Warbler
Strigiformes	Western Tanager
Great Horned Owl	Black-Headed Grosbeak
Common Barn Owl	California Brown Towhee
Burrowing Owl	Rufous-Sided Towhee
Apodiformes	Savannah Sparrow
Anna's Hummingbird	Song Sparrow
Black-Chinned Hummingbird	Dark-Eyed Junco
Picciiformes	White-Crowned Sparrow
Northern Flicker	Golden-Crowned Sparrow
Redbreasted Sapsucker	Fox Sparrow
Nuttall's Woodpecker	Western Meadowlark
Downy Woodpecker	Red-Winged Blackbird
Acorn Woodpecker	Brewer's Blackbird
Passeriformes	Brown-Headed Cowbird
Western Kingbird	Northern Oriole
Ash-Throated Flycatcher	American Goldfinch
Black Phoebe	Lesser Goldfinch
Say's Phoebe	House Finch
Horned Lark	Purple Finch
Barn Swallow	House Sparrow
Cliff Swallow	

Table 3. Resident (weedy) species.

Tier	Plants
Understory Plants	Wild barley (<i>Hordeum</i> spp.) Wild oat (<i>Avena fatua</i>) Italian ryegrass (<i>Lolium multiflorum</i>) Miscellaneous volunteer forbs
Shrubs	Tree tobacco (<i>Nicotiana glauca</i>)
Trees	Tree of heaven (<i>Ailanthus glandulosa</i>)

Table 4. Non-native cultivated plants.

Tier	Plants
Understory Plants	Orchard grass (<i>Dactylis glomera</i> ., cv 'Berber') Pubescent wheatgrass (<i>Thinopyrrum intermedium</i>) Tall wheatgrass (<i>Thinopyrrum</i> Canary grass, koeagrass (<i>Phalaris tuberosa</i> var. <i>hirtigulumis</i> , cv 'Perla') Creeping boobialla (<i>Myoporum parvifolium</i>) Silverlace vine (<i>Polygonum aubertii</i>) Wild fennel (<i>Foeniculum vulgare</i>)
Shrubs	<i>Myoporum</i> spp.
Trees	Aethel (<i>Tamarix aphylla</i>) Arizona cypress (<i>Cupressus arizonica</i>) Blue gum (<i>Eucalyptus globulus</i>) Red gum (<i>Eucalyptus camauldulensis</i>)

Table 5. Local native plants.

Tier	Plants
Understory Plants	Creeping wildrye (<i>Leymus triticoides</i>) Meadow barley (<i>Hordeum brachyantherum</i> ssp. <i>brachyantherum</i>) Purple needlegrass (<i>Nassella</i> [<i>Stipa</i>] <i>pulchra</i>) Slender wheatgrass (<i>Elymus trachycaulus</i>) Aster (<i>Aster chilensis</i>) Blue-eyed grass (<i>Sisyrinchium bellum</i>) California goldenrod (<i>Solidago californica</i>) Dutchman's pipe (<i>Aristolochia californica</i>) Gumweed (<i>Grindelia camporum</i>) Hedge-nettle (<i>Stachys ajugoides</i>) Heliotrope (<i>Heliotropium curassivicum</i> var. <i>oculatum</i>) Narrow-leaved milkweed (<i>Asclepias fascicularis</i>) Spike-rushes (<i>Heleocharis</i> spp.) Western goldenrod (<i>Euthemia occidentalis</i>) White-root sedge (<i>Carex barbarae</i>) Wild licorice (<i>Glycyrrhiza lepidota</i> , Fabaceae) Yarrow (<i>Achillea millefolium</i> [= <i>Achillea borealis</i>])
Shrubs	California coffeeberry (<i>Rhamnus californica</i>) California Wild Rose (<i>Rosa californica</i>) Coyote brush (<i>Baccharis pilularis</i>) Mexican elderberry (<i>Sambucus mexicana</i>) Mule fat (<i>Baccharis viminea</i>) Toyon (<i>Heteromeles arbutifolia</i>)
Trees	Valley oak (<i>Quercus</i>) Willows (<i>Salix</i> spp., Salicaceae)

Table 6. Augmented native plants.

Tier	Plants
Understory Plants	Deergrass (<i>Muhlenbergia rigens</i>) Creeping wildrye (<i>Leymus triticoides</i>) Meadow barley (<i>Hordeum brachyantherum</i> ssp. <i>brachyantherum</i>) Purple needlegrass (<i>Nassella</i> [<i>Stipa</i>] <i>pulchra</i>) Slender wheatgrass (<i>Elymus trachycaulus</i>) Aster (<i>Aster chilensis</i>) Blue-eyed grass (<i>Sisyrinchium bellum</i>) California goldenrod (<i>Solidago californica</i>) Dutchman's pipe (<i>Aristolochia californica</i>) Gumweed (<i>Grindelia camporum</i>) Hedge-nettle (<i>Stachys ajugoides</i>) Heliotrope (<i>Heliotropium curassivicum</i> var. <i>oculatum</i>) Narrow-leaved milkweed (<i>Asclepias fascicularis</i>) Spike-rushes (<i>Heleocharis</i> spp.) Western goldenrod (<i>Euthemia occidentalis</i>) White-root sedge (<i>Carex barbarae</i>) Wild licorice (<i>Glycyrrhiza lepidota</i> , Fabaceae) Yarrow (<i>Achillea millefolium</i> [= <i>Achillea borealis</i>])
Shrubs	Brewer saltbush (<i>Atriplex lentiformis</i>) California bladderpod (<i>Isomeris arborea</i>) California buckwheat (<i>Eriogonum fasciculatum</i>) California coffeeberry (<i>Rhamnus californica</i>) California fuchsia (<i>Zauschneria californica</i>) California Rose (<i>Rosa californica</i>) Cleveland sage (<i>Salvia clevelandii</i>) Coyote brush (<i>Baccharis pilularis</i>) Holly-leaf cherry (<i>Prunus ilicifolia</i>) Mexican elderberry (<i>Sambucus mexicana</i>) Mule fat (<i>Baccharis viminea</i>) Saint Catherine's lace (<i>Eriogonum giganteum</i>) Toyon (<i>Heteromeles arbutifolia</i>)
Trees	Gray pine (<i>Pinus sabiniana</i>) Fremont cottonwood (<i>Populus fremontii</i>) Valley oak (<i>Quercus lobata</i>) Willows (<i>Salix</i> spp.)

Table 7. Hedgerow installation and maintenance cost estimates for one hedgerow 1/4 mile long x 16 feet wide (~ 0.5 ac.) planted with a base of native grasses under one line of shrubs.

Task	Cost/Unit	Units		Total Cost
<i>Planning</i>	\$ 50.00	5	hour	\$ 250.00
<i>Weed Control pre-grass planting:</i>				\$ 30.00
Round-up material	\$ 15.00	1	hour	\$ 15.00
Application labor	\$ 35.00	0.5	hour	\$ 17.50
Two discings				\$ -
<i>Bed preparation (if furrow-irrigating):</i>	\$ 35.00	0.5	hour	\$ 17.50
Labor				\$ -
<i>Broadcast spreading grass seed with belly grinder:</i>	\$ 10.00	4	hour	\$ 40.00
Labor				
Grass seed (see list below)				\$225
<i>Harrow and roll to incorporate seed:</i>	\$ 15.00	2	hour	\$ 30.00
Labor				
<i>Weed control before grass emergence:</i>	\$ 15.00	1	hour	\$ 15.00
Labor				
Roundup material				\$ 30.00
<i>Broadleaf herbicide application, if necessary:</i>				\$ 20.00
Material (Buctril)				
Application Labor	\$ 15.00	2	hour	\$ 30.00
<i>Planting Shrubs and Perennial Forbs</i>	\$ 10.00	6	hour	\$ 60.00
Labor				
Box of 500 Fertilizer tablets				\$ 60.00
Plants				\$ 375.00
<i>Placing tubex protectors over shrubs:</i>	\$ 1.15	130	tube	\$ 149.50
Materials				
Labor	\$ 10.00	4	hour	\$ 40.00
<i>Placing weed mats around shrubs, if necessary:</i>	\$ 10.00	10	hour	\$ 100.00
Labor				
3'x3' tree mats	\$ 0.70	150	each	\$ 105.00
Ground stakes				\$ 88.00

<i>Installing Drip Irrigation System:</i>	\$ 10.00	25	hour	\$ 250.00
Labor				
Tubing, emitters, fittings, etc.				\$200.00
Total One-Time Costs				\$2,147.50
<i>Annual Maintenance Costs:</i>				
Mowing	\$ 25.00	1	hour	\$ 25.00
Spot spraying	\$ 15.00	2	hour	\$ 30.00
Material				\$ 30.00
Hoeing	\$ 10.00	8	hour	\$ 80.00
Irrigation				
One-year total				\$ 165.00
Five-year total				\$ 825.00
Cost of hedgerow over 5 years				\$2,972.50
Cost/year amortized over 10 years				\$ 297.25
Grass Seed Notes: Seeding rate = approximately 21-22 lb/a, or 50 seeds/sq. ft.				
<i>Nassella pulchra</i>	\$ 43.00	2.25	lb.	\$ 96.75
<i>Melica californica</i>	\$ 19.00	2.25	lb.	\$ 42.75
<i>Elymus glaucus</i>	\$ 8.00	1.5	lb.	\$ 12.00
<i>Leymus triticoides</i>	\$ 60.00	0.5	lb.	\$ 30.00
<i>Elymus trachycaulus</i>	\$ 4.50	1.5	lb.	\$ 6.75
<i>Hordeum brachyantherum</i>	\$ 12.00	2.25	lb.	\$ 27.00
<i>Bromus carinatus</i>	\$ 7.50	0.75	lb.	\$ 5.63
<i>Total cost of seed</i>				\$ 220.88

Brief Resume

Robert L. Bugg
Assistant To The Director
University of California Sustainable Agriculture Research and Education
Program
University of California
Davis, CA 95616-8716
916-754-8549
FAX: 916-754-8550
rlbugg@ucdavis.edu

Education

1981-1986: University of California at Davis, Ph.D., Entomology.
 1976-1978: University of California at Berkeley, M.S., Entomology.
 1973-1975: University of California at Davis, B.S., Entomology.
 1970-1973: University of California at Santa Barbara

Selected Honors and Awards

1992: Elvenia J. Slosson Endowment Fund for Ornamental Horticulture: \$12,000.00
 awarded for roadside prairie research.
 1992: Pacific Gas and Electric Award for Research Excellence In Wildlands: \$5,400.00
 awarded for research on prairie complexes for suppression of weeds in rights-of-way.
 1994: IPM Innovator Award (by the California Department of Pesticide Regulation), given
 jointly to members of the Management Team of Biologically Integrated Orchard
 Systems (BIOS) for Merced County almonds (I was co-originator of BIOS, with
 Richard Reed).
 1995: Beacon of Light Award from Community Alliance with Family Farmers Foundation
 (CAFF Foundation) for participation on the Management Team of Biologically
 Integrated Orchard Systems (BIOS) for Merced County almonds.
 1996 Bronze medal for the U.C. Sustainable Agriculture Research and Education Program
 worldwide website (<http://www.sarep.ucdavis.edu>). National Council for
 Advancement and Support of Education (CASE).
 1997 Silver medal - Agricultural Communicators in Education (ACE) for the U.C.
 Sustainable Agriculture Research and Education Program worldwide website.
 1997: City of Davis Environmental Recognition Award, Individual Category.

Refereed Publications

Original Research Articles

Bugg, R.L. 1987. Observations on insects associated with a nectar-bearing Chilean tree,
Quillaja saponaria. Pan-Pacific Entomologist 63:60-64.
 Bugg, R.L., C.S. Brown, and J.H. Anderson. 1997. Restoring native perennial grasses
 to rural roadsides in the Sacramento Valley of California: establishment and evaluation.
 Restoration Ecology 5. In press.
 Bugg, R.L., and J.D. Dutcher. 1989. Warm-season cover crops for pecan orchards:
 horticultural and entomological implications. Biological Agriculture and Horticulture
 6:123-148.
 Bugg, R.L., and J.D. Dutcher. 1993. *Sesbania exaltata* (Rafinesque-Schmaltz) as a
 warm-season cover crop in pecan orchards: effects on aphidophagous Coccinellidae
 and pecan aphids. Biological Agriculture and Horticulture 9:215-229.

- Bugg, R.L., J.D. Dutcher, and P.J. McNeill. 1991. Cool-season cover crops in the pecan orchard understory: effects on Coccinellidae (Coleoptera) and pecan aphids (Homoptera: Aphididae). *Biological Control* 1:8-15.
- Bugg, R.L., L.E. Ehler, and L.T. Wilson. 1987. Effect of common knotweed (*Polygonum aviculare*) on abundance and efficiency of insect predators of crop pests. *Hilgardia* 55(7):1-53.
- Bugg, R.L., and R.T. Ellis. 1990. Insects associated with cover crops in Massachusetts. *Biological Agriculture and Horticulture* 7:47-68.
- Bugg, R.L., R.T. Ellis, and R.W. Carlson. 1989. Ichneumonidae (Hymenoptera) using extrafloral nectar of faba bean (*Vicia faba* L., Fabaceae) in Massachusetts. *Biological Agriculture and Horticulture* 6:107-114.
- Bugg, R.L., G. McGourty, M. Sarrantonio, W.T. Lanini, and R. Bartolucci. 1996. Comparison of 32 cover crops in an organic vineyard on the north coast of California. *Biological Agriculture and Horticulture* 13:65-83.
- Bugg, R.L., S.C. Phatak, and J.D. Dutcher. 1990. Insects associated with cool-season cover crops in southern Georgia: implications for pest control in the truck-farm and pecan agroecosystems. *Biological Agriculture and Horticulture* 7:17-45.
- Bugg, R.L., F.L. Wäckers, K.E. Brunson, J.D. Dutcher, and S.C. Phatak. 1991. Cool-season cover crops relay intercropped with cantaloupe: influence on a generalist predator, *Geocoris punctipes* (Hemiptera: Lygaeidae). *Journal of Economic Entomology* 84:408-416.
- Bugg, R.L., F.L. Wäckers, K.E. Brunson, S.C. Phatak, and J.D. Dutcher. 1990. Tarnished plant bug (Hemiptera: Miridae) on selected cool-season leguminous cover crops. *Journal of Entomological Science* 25(3):463-474.
- Bugg, R.L., and L.T. Wilson. 1989. *Ammi visnaga* (L.) Lamarck (Apiaceae): associated beneficial insects and implications for biological control, with emphasis on the bell-pepper agroecosystem. *Biological Agriculture and Horticulture* 6: 241-268.
- Ehler, L.E., R.L. Bugg, M.B. Hertlein, H.P. Sauter, and K. Thorarinsson. 1987. Patch-exploitation patterns in an egg parasite of elm leaf beetle. *Entomophaga* 32:233-239.
- Maingay, H., R.L. Bugg, R.W. Carlson, and N.A. Davidson. 1991. Predatory and parasitic wasps (Hymenoptera) feeding at flowers of sweet fennel (*Foeniculum vulgare* Miller var. dulce Battandier & Trabut, Apiaceae) and spearmint (*Mentha spicata* L., Lamiaceae) in Massachusetts. *Biological Agriculture and Horticulture* 7:363-383.
- Ouyang, Y., E.E. Grafton Cardwell, and R.L. Bugg. 1993. Effects of various tree and grass pollens on development, survivorship and reproduction of *Euseius tularensis* (Acari: Phytoseiidae). *Environmental Entomology* 21:1371-1376.
- Sumner, D.R., S.C. Phatak, J.D. Gay, R.B. Chalfant, K.E. Brunson, and R.L. Bugg. 1995. Soilborne pathogens in a vegetable double-crop with conservation tillage following winter cover crops. *Crop Protection*. 14:495-500.

Scholarly Review Articles

- Bugg, R.L. 1991. Cover crops and control of arthropod pests of agriculture. Pp. 157-163 in: W.L. Hargrove (editor). *Cover Crops for Clean Water*. Proceedings of an international conference, West Tennessee Experiment Station, Jackson, TN, April 9-11, 1991. Soil and Water Conservation Society. Ankeny, IA. XII + 198 pp.
- Bugg, R.L. 1992. Using cover crops to manage arthropods on truck farms. *HortScience* 27(7):741-745.
- Bugg, R.L., M. Sarrantonio, J.D. Dutcher, and S.C. Phatak. 1991. Understory cover crops in pecan orchards: possible management options. *American Journal of Alternative Agriculture* 6(2):50-62.
- Bugg, R.L., and C. Waddington. 1994. Managing cover crops to manage arthropod pests of orchards. *Agriculture, Ecosystems and Environment*. 50:11-28.

Other Peer-Reviewed Publications

- Auburn, J.S., and R.L. Bugg. 1991. An information data base on cover crops. Pp. 11-14 in: W.L. Hargrove (editor). *Cover Crops for Clean Water*. Proceedings of an international conference, West Tennessee Experiment Station, Jackson, TN, April 9-11, 1991. Soil and Water Conservation Society. Ankeny, IA. XII + 198 pp.
- Ingels, C., M. Van Horn, R.L. Bugg, and P.R. Miller. 1994. Selecting the right cover crop gives multiple benefits. *California Agriculture* 48(5):43-48.
- Phatak, S.C., R.L. Bugg, D.R. Sumner, J.D. Gay, K.E. Brunson, and R.B. Chalfant. 1988. Cover crop effects on weeds, diseases, and insects of vegetables. Pp. 153-154 in: W.L. Hargrove (editor). *Cover Crops for Clean Water*. Proceedings of an international conference, West Tennessee Experiment Station, Jackson, TN, April 9-11, 1991. Soil and Water Conservation Society. Ankeny, IA. XII + 198 pp.
- Pickett, C.H., and R.L. Bugg (editors). 1997. *Enhancing Biological Control of Arthropod Pests through Habitat Manipulation*. University of California Press, Berkeley, California. In press.

Selected Work In Progress

- Brown, C.S., and R.L. Bugg. In preparation. A comparison of propagation and transplanting techniques for two clonal perennial forbs, narrow-leaved milkweed (*Asclepias fascicularis*) and blue-eyed grass (*Sisyrinchium bellum*). For Publication in *Restoration And Management Notes*.
- Bugg, R.L., and J.H. Anderson. 1997. Farmscaping: Hedgerows, native grasses, cover crops, and wild plants for biointensive pest management. In: Pickett, C.H. and R.L. Bugg (editors). *Habitat Management to Enhance Biological Control of Arthropod Pests of Agriculture*. University of California Press, Berkeley, CA. In press.
- Bugg, R.L., and A.C. Cohen. In preparation. Agriculturally important bigeyed bugs (*Geocoris* spp.) of America north of Mexico. For submission to *Biological Control*. Manuscript.
- McGuinn, R.P., R.L. Bugg, and A.M. Berry. In preparation. Nitrogen dynamics in a non-tillage cover-cropped organic almond orchard. For submission to *Soil Biology and Biochemistry*.
- Rämert, B., M.R. Werner, R.L. Bugg, R.P. McGuinn, and A.M. Berry. In preparation. Inoculative release of *Lumbricus terrestris* L.: Disappearance of vetch hay in an organic walnut orchard and in a controlled-environment microcosm. For submission to *Soil Biology and Biochemistry*. Manuscript.

List Of Cooperators

A. Sid England, Ph.D.
Environmental Planner
Office of Planning and Budget
University of California
One Shields Avenue
Davis, CA 95616
asengland@ucdavis.edu

R. Ford Dennison, Ph.D.
Department of Agronomy and Range
Science
University of California
One Shields Avenue
Davis, CA 95616

D. Michael Fry, Ph.D.
Director
Center For Avian Biology
University of California
One Shields Avenue
Davis, CA 95616
dmfry@ucdavis.edu

Paul Robins, Ph.D.
Yolo Resource Conservation District
221 West Court Street No. 1
Woodland, CA 95696
pkrobins@dcn.davis.ca.us

Craig D. Thomsen, M.S.
Department of Agronomy and Range
Science
University of California
One Shields Avenue
Davis, CA 95616

John Yates, Ph.D.
Special Project Director
Office of Administration
University of California
1 Shields Avenue
Davis, CA 95616